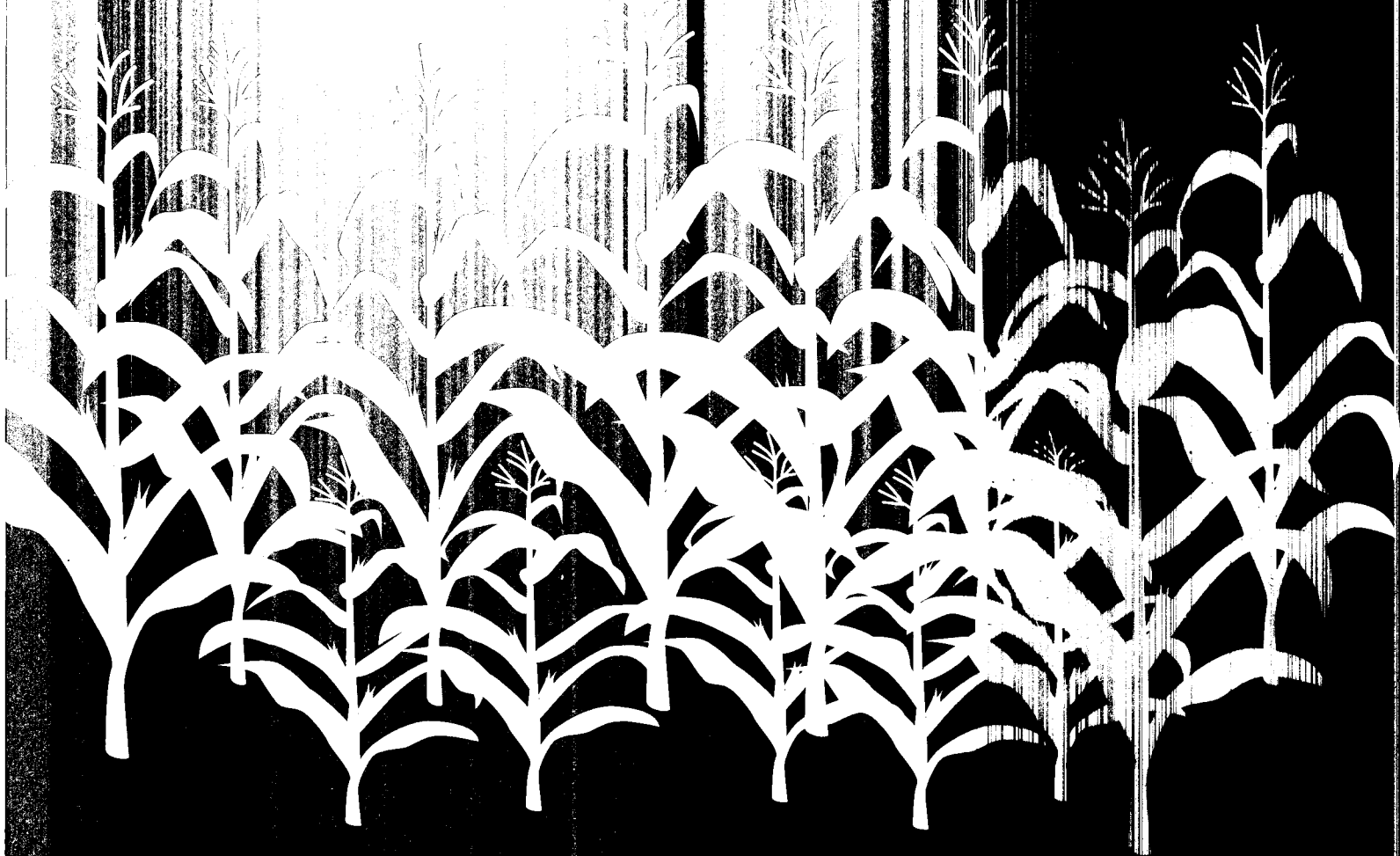


GLOBAL WASTE Journal

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COMPOST WISHES



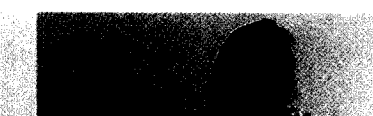
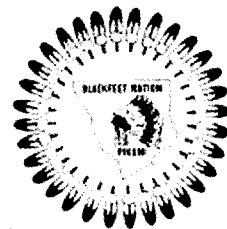
BACKYARD COMPOSTING
—THE BENEFITS START
AND STAY AT HOME

TURNING FISH AND
FOOD WASTE INTO
RESOURCES

KIDS WORM UP TO
VERMICOMPOSTING

completing the 18th annual Great Lakes Fishery Conference, which was held in conjunction with the 1988 Great Lakes Fishery Conference. The conference was held in conjunction with the 1988 Great Lakes Fishery Conference. The conference was held in conjunction with the 1988 Great Lakes Fishery Conference.

Indian Reservation covers more than 1.5 million stunning acres of plains, rolling hills, and mountainous forests in northwestern Montana. Despite its vast size, the Blackfeet were able to rally their 10,000 reservation residents to help turn a small EPA grant into a big benefit in terms of reducing waste, giving back to the Earth, and nurturing the community.



Harnessing the creativity and energy of all of its community members, including school children, elders, an herbologist, and organizations like the Headstart Program, helped the tribe get their vermicomposting program off the ground. We spoke with Gerald Wagner, director of the Tribal Environmental Office and Mary Ellen Flamand, solid waste coordinator, about their approach to vermicomposting. The following are excerpts from our conversations:

TWJ: Why did you choose to promote vermicomposting versus other types of composting?

Mr. Wagner: Through a waste stream analysis, we found that a large portion of our waste stream was food wastes. Because of our

harsh weather—long, cold winters beginning in October and lasting through late-April or early-May—vermicomposting is good because it can be done indoors under the kitchen sink or in a back pantry. The red wigglers are great! They consume more than their body

weight everyday. They just eat, eat, eat! Also, you don't have to turn the waste. The worms do all the work and the end result is nutrient rich compost and worm tea, which can be used in gardening.

TWJ: How does vermicomposting fit into your comprehensive solid waste management plan?

Mr. Wagner: Vermicomposting is a great way to get tribal members into a recycling mindset and into the habit of separating wastes. With vermicomposting, they are already separating out food scraps, so then separating aluminum, glass, plastics, and cardboard would be a logical next step. We are in the process of closing our current dump site and opening a new transfer station. As part of the transfer station, we are planning an outdoor composting operation. Composting is one part of our comprehensive solid waste management plan and will help us reduce the amount of waste passing through our transfer station, which will reduce our disposal costs.

Ms. Flamand:

We're also encouraging tribal members to grow their own foods. Diabetes is a major health issue on the reservation. We hope that by growing healthful foods in family gardens, people will improve their eating habits and their health. We share this goal with Wilbur Fish, the Blackfeet Community College (BCC) Extension Agent and herbologist. Wilbur runs the greenhouse at BCC that now has two giant worm bins that use food scraps collected at the Head Start

vermicomposting. A great way to get tribal members into a recycling mindset and into the habit of separating wastes. With vermicomposting, they are already separating out food scraps, so then separating aluminum, glass, plastics, and cardboard would be a logical next step.

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Program and a local restaurant. He uses the worm castings as a soil amendment. We have also been working with Wilbur and the college to promote the construction of community hot houses to help with family gardens.

TWJ: How did you fund your vermicomposting initiative?

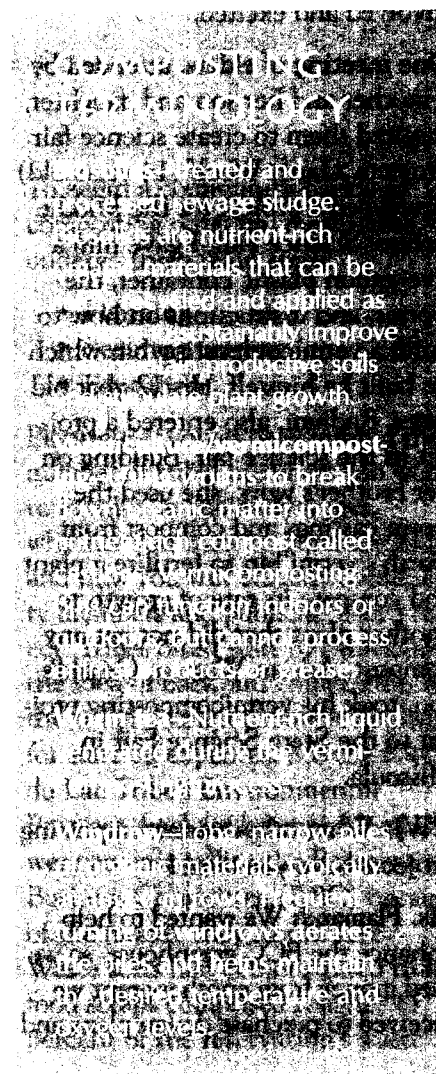
Mr. Wagner: We got our start when our EPA Tribal Coordinator for Montana, Stephanie Wallace, contacted us about available funding. She had been reviewing our comprehensive solid waste management plan and saw our plan for a vermicomposting program. From this, we received a \$20,000 grant. The fact that we already had a solid waste coordinator on staff helped us to immediately start our program. We hope that the continued support of the tribe and college can help us keep the program going.

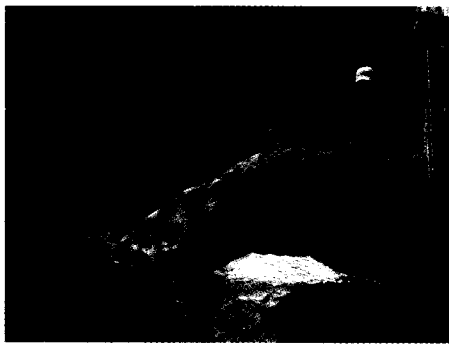


Stephanie Wallace, EPA Tribal Coordinator for Montana, working with the vermicomposting program.

TWJ: How did you get the community involved? What was the community's reaction?

Ms. Flamand: When we started our vermicomposting project, we wanted to work with small children to teach them about composting and get them excited and involved. We coordinated with the Blackfeet Head Start program in Browning to collect their food scraps for the worms. At first, the staff was reluctant, but once we met with them and the project progressed they became really excited about it. We only collect about a pound of food scraps each week from the Head Start, so it is primarily an educational effort, but we feel it is worthwhile.





1. Making fish and wood chips into compost. Ships and planes

Council (WORC). "I thought the class would be a breeze," said Mills. Instead he found himself surrounded by scientists, seasoned compost operators, and instructors who used words such as "thermal treatment" and "bulking agents." Mr. Mills studied morning and night, and the instructor helped him master the material by defining new terms. On the fifth day, Mr. Mills passed the final exam with flying colors.

During the training, Mr. Mills realized that he had made some mistakes during his first few months as composting manager, and he learned how to correct them. He discovered, for example, that his compost piles were too moist, creating anaerobic conditions that stymied the decomposition process. He remedied the situation by increasing airflow through the piles and placing tarpaulins on them to minimize rain infiltration.

Mr. Mills approached the village and explained that he needed more equipment for the composting venture. Recognizing that the project possessed tremendous economic potential, Kake invested more than \$1 million in new equipment, purchasing a 2200 Cat backhoe, a 16-foot Scarab turner, and a bagging machine. Workers use the backhoe to dig a long 'V' down the center of each row of sawdust or wood chips



2. Making fish and wood chips into compost. Ships and planes

before adding fish waste. The Scarab turner is essential to the operation—imagine turning 200-foot-long piles by hand! The bagging machine enables workers to package the product for sale. Although Kake needed this equipment to succeed, heavy machinery is expensive, and the village was forced to close its cold storage operation, temporarily, to support the composting enterprise.

Although fish waste and wood abound on Kupreanof Island, logging debris must be chipped before Kake can use it in compost piles. During the first year, Mr. Mills purchased sawdust from a logging company located 100 miles south of the island because he could not chip the wood scattered about the island. He conducted an Internet search and located Bobby Wolfer, a businessman in the state of Washington who sells tubgrinders. Mr. Mills called Mr. Wolfer regularly for a year, cultivating a relationship with him. Eventually, Mr. Wolfer visited Kake to inspect the composting operation. The visit convinced Mr. Wolfer that Kake could succeed, and he worked with Mr. Mills to transport a tubgrinder, which cost approximately \$470,000, to Kupreanof Island.

Mr. Mills used a value-added producer grant from the U.S. Department of Agriculture's Rural

Development Service to hire Aadland Marketing. Kake used this firm for past projects, so Aadland Marketing employees were already familiar with the village's culture and goals. In fact, Kake approached Aadland Marketing's Greg Galik for help with the grant application. Mr. Galik worked closely with Mr. Mills and other representatives from Kake to draft an 80-page proposal for a marketing feasibility study that would allow the village to determine the price of its product, identify ideal product packaging, and create a promotion strategy. Kake requested \$77,000 and received \$47,327, which it matched.

Kupreanof Island is along a major shipping route between Juneau and Ketchikan. Ships traveling north from Seattle carry supplies to Anchorage and return with empty containers. Aadland Marketing contacted several shipping companies and discovered that Kake could move its compost to Washington state (where demand for quality compost is high) in these empty containers for only a small fee. Next, Mr. Galik organized focus groups in Washington and provided samples of Kake's compost to gardeners and landscapers, who agreed that the product was loamy with a pleasant earthy smell. They liked the idea of compost generated from natural materials free of chemicals, so Aadland Marketing encouraged Kake to get its product certified as organic. The focus group participants also felt that "Totem Soils" was the perfect name for Kake's compost and that it should be packaged in attractive 12-quart bags.

In addition to organizing focus groups, Aadland Marketing urged Kake to get its product tested for pathogens, metals, and general quality. Although Kake does not compost human waste, the village chose to follow EPA's

biosolid composting regulations to ensure a vector and pathogen-free final product. Laboratory tests confirmed that Kake's compost is high-quality potting soil, although Mr. Galik pointed out, "Kake's windrows are young and compost is like a fine wine. It becomes more valuable as it gets older." Aadland Marketing suggested that Kake publicize these test results to demonstrate the quality of its product.

Aadland used the information obtained from the focus groups and product testing to create effective marketing brochures and a Web site for greenhouse operators and retailers. Mr. Galik and Mr. Mills are developing relationships with some of these individuals and hope to obtain several contracts before the next growing season. In 2003, Kake established 4,000 linear feet of windrows and composted 6 million pounds of fish waste, although Mr. Mills believes the operation could easily be expanded because fish waste is abundant in Southeast Alaska. Fish processors throughout the region are searching for alternatives to dumping this waste into local bodies of water, where it

disturbs ecosystems. Mr. Mills hopes to obtain a contract with a large retailer that demands large quantities of compost from its suppliers. If Kake secures a contract with this type of company, composting on Kupreanof Island could mitigate a regional environmental problem in addition to providing jobs for locals.

Local Challenges

While Mr. Mills waits to hear from retailers, he must continue to maintain the compost piles and meet local challenges. Bears, fluctuating rainfall, and odors are ongoing challenges facing the operation, and Mr. Mills must address them to keep the windrows intact and village residents content. For example, bears harass workers as they turn the compost piles. Mr. Mills does not have the funding to erect fences around the windrows, so he must chase away the bears on foot.

Climate also presents an obstacle. Southeast Alaska experiences a rainy season in the fall and winter and a dry season in the spring and summer, which makes maintaining proper moisture levels in compost piles difficult. During the summer, Mr. Mills must add water to the windrows, and during the winter, he must cover them with tarpaulins to keep them dry. Eventually, he would like to obtain funding for a warehouse to keep the curing piles out of the elements and away from bears.

Trucks loaded with fish waste used to pass through Kake, traveling from the fish processing plant to the compost site, until residents complained of the associated stench. Mills asked the truck drivers to circumvent the village, adding several miles to the trip, but appeasing community members.

U.S. DEPARTMENT OF AGRICULTURE'S VALUE-ADDED RURAL DEVELOPMENT PRODUCER GRANTS

When Mr. Mills needed funding to build a marketing firm, he turned to the U.S. Department of Agriculture's (USDA) Rural Development Service for assistance. USDA offers value-added producer grants, which growers and villages can use to develop and implement marketing plans for value-added agricultural products such as compost. As Mr. Mills discovered, the grant application is easy to fill out and not consuming, but it does have a few caveats. The average grant is \$10,000 to \$25,000, although grants can be as high as \$50,000.

USDA grants are for up to \$50,000 and grant recipients must match 100 percent of the funds.

USDA establishes the value-added producer grant application deadline each year, usually in August. The USDA publishes the value-added producer grant application deadline in the *Federal Register* and announces this information on its Web site at www.rurdev.usda.gov/rbs/coops/vadg.htm. For a list of state office contacts, visit www.rurdev.usda.gov/rbs/coops/vadgstateoffice.html.

Despite such obstacles, Mr. Mills remains confident that Kake's composting operation will be successful. He believes that gardeners will request the premium Totem Soil when they learn about it. He also hopes to begin accepting fish waste from other processing plants in Southeast Alaska. While Mr. Mills waits for Totem Soil to gain popularity, he provides advice to others interested in composting. In 2004, for example, he attended a wood utilization convention in Anchorage and delivered a presentation on Kake's project with a message of hope. "It's been a struggle," said Mr. Mills. "But I'm glad we're doing it."



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Totem Soil™ is a nutrient rich, long lasting, and easy to use composting product. It is made from the best quality of fish waste and forest products. It is a natural, non-toxic, and safe product. It is a natural, non-toxic, and safe product. It is a natural, non-toxic, and safe product.

Thank you for purchasing our Totem Soil™ Compost!

12 QT (19.3 L) DRY WEIGHT

OUT OF SIGHT, OUT OF MIND

Odors are a common problem for large-scale composting operations. "especially early on when you are learning and perfecting your process," states Mr. Long. The Cherokee initially experienced odor problems because the compost piles were not receiving enough oxygen. When they switched from a front-end loader to a windrow turner to turn the piles, the odor problem was virtually eliminated. However, neighboring community members continued to complain. To solve the problem, compost operators planted bamboo between the station and neighboring property, and the complaints died off. Explained Mr. Long, "If people see your process and it looks like it should smell, then people will complain about it smelling. If they can't see it, then they don't know or think that there is anything to complain about." He emphasizes that locating the facility away from homes when possible allows you to address odor concerns before community members complain.

Tribal council members have been very supportive of the composting program because they recognize the cost savings and benefits. As Mr. Long explains, "We had to go before the tribal council and show the actual numbers from our pilot project to demonstrate the cost savings. It is like going to a bank for a loan—you need to show them something concrete. Once we showed the council our numbers, it was a no-brainer."

Another factor the tribe considers critical to their success is the strong rapport they maintain with the local restaurants that generate the food waste. Mr. Bottchenbaugh keeps an open line of communication with the restaurant managers, speaking to them nearly every day. He stresses the importance of being flexible with the restaurants and responding to their needs. Tribal utilities employees generally pick up the food scraps two or three times per day, but if the restaurants request more than three pickups, the composting employees gladly oblige.

The tribe sells most of its compost to residents, tribal roads divisions,

and other tribal programs that pick up the product at the transfer station. While the Eastern Band of Cherokee has not bagged its compost, it has begun marketing it to organizations off the reservation. Mr. Bottchenbaugh is talking to Harrah's about purchasing compost from the tribe, and he is also working with the North Carolina Department of Transportation, which is interested in using composting berms to replace silt fences.

Word-of-mouth has carried the testament of the high quality of the Cherokee compost throughout the community. Local organic farmers rave about the high nutritional value of the compost, and the tribe has collected letters from enthusiastic customers. The owner of Cherokee Daylily Gardens attests, "In all our years of growing daylilies, we have never experienced this rate of reproduction." As Mr. Long summarizes, "It took a little while to get people to use and want our products. Now that people have seen the results they get with our compost and realized the nutrient value of the food waste compost, we can't keep the stuff."

A Return to Tradition

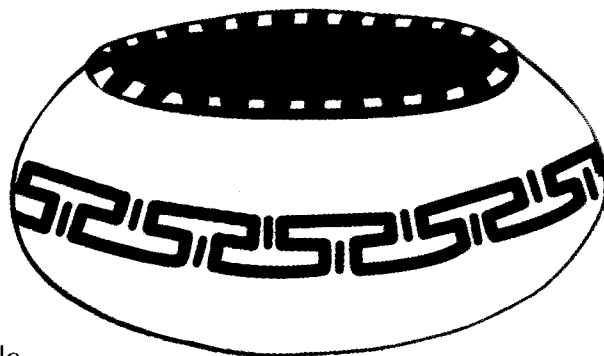
Above and beyond the practical benefits of composting, its practice has a history within Cherokee tradition. As Mr. Bottchenbaugh describes, "My grandpa says that he can remember his grandma throwing food waste in a pile of leaves and rolling it around." Mr. Long adds, "As a farmer, I have composted all of my life, I just didn't know it at the time. When we cleaned out the animals' stalls, we piled the straw and manure and let it decompose. Then we spread it on our fields. We were composting, we just didn't call it that." Thus, composting offers the added value of bringing the tribe back in touch with its roots. In addition to composting, tribal members were traditionally farmers—growing vegetables such as corn, potatoes, beans, and squash. Tribal employees believe that gardening is good for the community because it reacquaints people with this agricultural tradition.

To encourage tribal members to garden, the tribe has given away free or discounted compost. The tribe's extension office recently worked with the Chief to provide community members with coupons for compost to promote gardening. All 150 coupons issued by the office were redeemed. People came to pick up the compost at the transfer station, and at the same time the tribe gave away gardening kits.

As the program moves forward, Mr. Bottchenbaugh is pleased with this additional benefit for the tribal community. "The composting coupons benefit more than just the transfer station's bottom line," Mr. Bottchenbaugh said. "The Cherokee people have a rich history of farming, and the composting coupons encourage them to get back to gardening."

Unique Gardens Grow Deep Into Cultural Roots

In addition to reducing waste and generating a valuable soil amendment, composting contributes to the revival of traditions and the preservation of cultural knowledge. Ho-Chunk Nation's project demonstrates that tribes can use composting to reconnect with their agricultural roots. The Eastern Band of Cherokee Indians, which once relied on agriculture for survival, distributed coupons for free compost to tribal members to encourage the rediscovery of home gardening. But some tribes are taking the cultural component of composting and gardening projects to the next level. For example, the Mashanantucket Pequots and the Pomo Indians of Redwood Valley Rancheria are cultivating endemic species to restore lost arts and historical knowledge.



A garden roof atop the Mashantucket Pequot Museum and Research Center offers environmental, aesthetic, and cultural benefits. Many garden roofs contain "green" features, such as compost piles, but the Pequot's roof serves a greater purpose. The museum borders a swamp filled with rhododendrons that provided refuge to the Pequots during King Philip's War. To preserve this historical site and create an idyllic setting for special events, the tribe decided to install the garden roof, which reduces runoff into the swamp and contains decks and paths for meetings and receptions.

Initially, the Mashantucket Pequot tribal council envisioned gardens with plants native to the Northeast and hired experts to develop a collection. The tribe, however, had trouble with these contractors and replaced them with tribal maintenance employees who lacked knowledge of native plants. As a result, the garden morphed from a collection of indigenous species to a haven for non-native ones.

The green roof continues to evolve as the Pequots find ways to meet new challenges and increase the potential for cultural education.

Tribal members hope to replace many of the exotic species with native ones and plan to populate garden beds with plants that their ancestors used for food, medicine, and other purposes. The gardens will include species such as Indian hemp, which is used to make rope, and blood root, which is used to treat blood ailments. Despite some obstacles, such as minor leaks in the roof, the museum staff remain committed to maintaining the roof and improving public access to ethnobotanical information.





Like the Mashantucket Pequots, the Pomo Indians of Redwood Valley Rancheria discovered a way to connect gardening with cultural restoration. The tribe received a social economic development grant from the Administration for Native Americans (part of the U.S. Department of Health and Human Services) to develop a white root sedge garden. Historically, Pomo Indians wove baskets from the roots of white root sedge plants. Although white root sedge grows naturally along streams and rivers near Redwood Valley Rancheria, tribal members cannot access the plants because the tribe does not

own riverfront property. In the grant application, the tribe framed the garden as a heritage preservation and economic development project—tribal members would use the white root sedge to create traditional baskets and sell baskets, roots, and entire sedge plants to generate revenue.

To prepare the garden for the sedge plants, tribal members dug trenches, and applied a small amount of compost, then added 6 to 8 inches of clean sand to imitate the natural terraces where white sedge usually grows. Ironically, it is important that the compost is below the sand so that only the deep nutritional

roots of the sedge plant reach it. The shallow roots, which are harvested for the baskets, turn dark when they are in nutrient rich soil such as compost. Basket makers prefer the roots to be light, as they decorate the baskets with dark materials and the decorations stand out better against a light foundation.

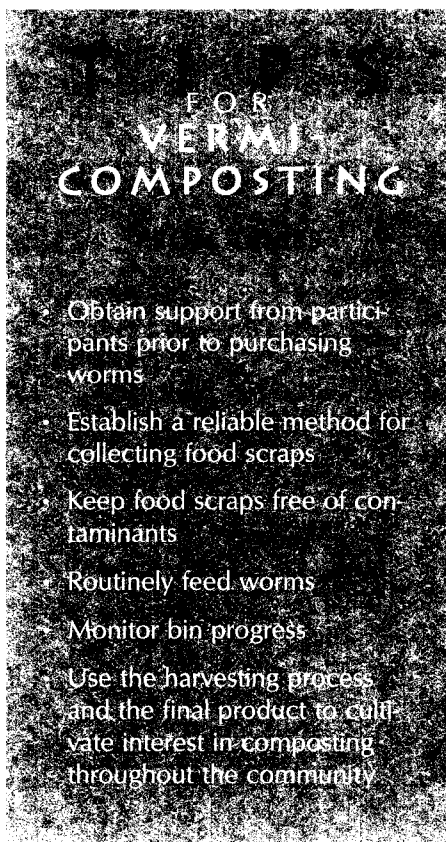
In addition to helping the tribe revive the lost art of basket making, the white root sedge garden generates environmental benefits. White root sedge plants can filter pollutants from runoff and stabilize soil along highways and near parking lots, protecting streams and rivers. The tribe already moved dozens of plants from the garden to the edge of the parking lot of the tribe's new education building. In addition, the California Department of Transportation purchased some of Redwood Valley Rancheria's sedge plants for a bioremediation project along a highway. These pilot projects enabled tribal members to determine the conditions white root sedge requires to thrive. The tribe plans to apply this information to future projects, market the sedge plants to new customers, and prove that economic development and cultural revival can complement one another.

FOR VERMICOMPOSTING

You've heard of guinea pigs and hamsters as school pets, but have you ever met teachers who welcomed worms into their classrooms? Staff and students at Oneida Nation's Turtle Elementary School proudly care for thousands of worms that process food scraps and old newspapers into valuable compost. Cafeteria workers set aside food scraps for the worms during food preparation, and science teachers help students feed and care for the worms.



The Oneida Nation of Wisconsin is not the only tribe to recognize the power of red wigglers (*Lumbricus rubellus*), which can eat half of their body weight in 24 hours. Deanna Himango and Nathan Reinbold, of the Fond du Lac Band of Lake Superior Chippewa's Natural Resources Division, implemented a vermicomposting program on the reservation. This program started at the local Ojibwe School and expanded to 200 households. Mr. Reinbold estimates that approximately one in three families living on the reservation composts, using either an indoor worm bin or a traditional outdoor bin. As a result, the tribe saves thousands of dollars on waste management each year.



Locating funding for a vermicomposting program, educating appropriate staff, setting up worm bins, and establishing a consistent feeding routine takes time, but now the programs at both Turtle Elementary School and Ojibwe School are self-sufficient. The schools no longer receive grants or outside sources of funding for vermicomposting, but their worms continue to multiply, and each year, the schools compost more organic waste. Between 2000 and 2002 alone, Ojibwe School composted approximately 5,200 pounds of food, saving the tribe \$3,300 in hauling fees.

Obtaining Support

Obtaining support for a vermicomposting program from participants prior to setting up bins is critical. Ms. Himango held worm committee meetings at the Ojibwe School to convince cafeteria staff,

administrators, and science teachers that worms make good indoor companions, despite their reputation as slimy outdoor critters. At the meetings, Ms. Himango explained that a properly maintained worm bin has a pleasant earthy odor. She also pointed out that vermicomposting would save the tribe money and conserve landfill space. Although the meetings allayed many fears, it took the enthusiasm of children to fully convince adults that vermicomposting was a worthy venture. "Initially the yuck factor made some faculty members reluctant to participate," said Laura Manthe, the vermicomposting program coordinator. "But they came around quickly when they saw how excited the kids were about the project."

The projects at Turtle Elementary School and Ojibwe School demonstrate that vermicomposting is not



for everyone. Initially, children and a few progressive adults were the only community members excited about worm bins. Their enthusiasm was contagious on Fond du Lac Reservation, where a number of children convinced their parents to compost.

When Ms. Manthe proposed a vermicomposting program at Turtle Elementary School, some faculty members argued that the students would not be able to remember which food scraps to collect for the worms. It took only three days, however, for the children to master their new roles in the cafeteria. Kindergartners through eighth graders collect food scraps in 5-gallon red bins each day during lunch. The older students weigh the scraps, load the red containers onto a wagon, and feed the worms, burying extra scraps in an outdoor compost pile. These children monitor the

collection bins to ensure that meat, bones, and dairy products do not contaminate the worm food.

Fond du Lac's Ojibwe School operates a similar food scrap collection system. Each day, third graders termed "worm wrigglers" obtain a copy of the lunch menu, highlight the items worms can eat, place the menu near a red bin for food scraps, and oversee the collection process.

Though worms are not picky eaters, they require a blend of nitrogen-rich food scraps and carbon-rich bedding material to remain happy. The worms at Ojibwe School and Turtle Elementary School thrive because teachers and students ensure that they eat a balanced diet. At both schools, worms receive food year-round.

At Ojibwe School teachers have discovered a way to reduce the amount of time spent caring for the worms—food scraps are stored in a refrigerator and added to the

vermicomposting bins periodically rather than every day. Teachers often take care of feeding the worms, involving the students when time allows. Alternatively, students at Turtle Elementary School feed their worms every day, as the process takes less than 15 minutes.

In addition to reducing waste hauling fees, a vermicomposting program can strengthen bonds in the community and generate interest in composting by fostering communication between children and adults. At Turtle Elementary School, students use a screening table to separate the worms from their castings. Then they mix the worm castings with soil and spread them over raised garden beds, where they grow fruits and vegetables such as raspberries, squash, potatoes, and broccoli. The students enjoy weeding the garden and caring for the plants, as the teachers turn these activities into social events. Each fall, the



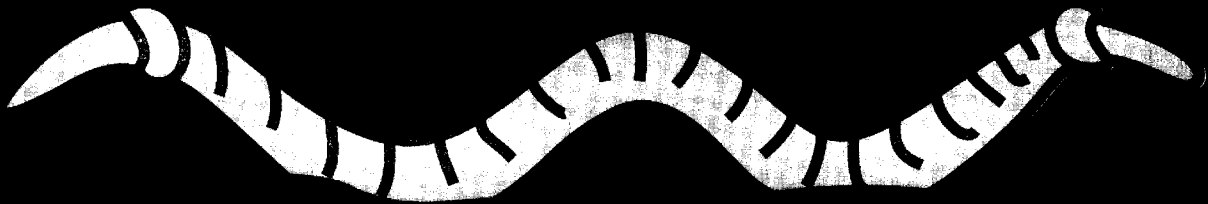
SELECTING AND SETTING UP A WORM BIN

Indoor composting bins range from the homemade variety to special three-tiered systems. Although the Fond du Lac Environmental Department distributes recycled-content plastic bins to community members, it uses four large metal troughs for vermicomposting at Ojibwe School. The Oneida Tribe uses 30 25-gallon plastic containers for the Turtle Elementary School Project.

Any vermicomposting bin must include a cover, as worms like dark, moist environments. Also, worms like to feed near the surface, so a bin should not be too deep. Holes near the bottom of a vermicomposting bin allow nutrient-rich liquids from the decomposing waste to drain.

After selecting a bin of the appropriate size, the next step is to shred bedding material such as newspaper, computer paper, or leaves into small pieces, soak them in water, and spread them around the bin. Worms ingest grit and store it in a digestive organ called a gizzard, where it is used to grind up food; therefore, it is important to sprinkle a gritty substance such as crushed oyster shells, sand, or soil throughout the bedding material.

The final step in setting up a worm bin is adding the worms. Most experts suggest using red wigglers (*Lumbricus rubellus*) or brandling worms (*Eisenia foetida*), which can be purchased from worm farms or garden supply catalogs. After giving the worms a chance to adjust for a few days, food scraps can be added.



children harvest the organically grown produce and prepare dishes for a community feast. Adults bring venison, buffalo, and other treats.

At Ojibwe School, worm wigglers bring messages about composting home to their parents. In addition, students at the school sell their worm castings and "tea"—the nutrient-rich liquid generated during the

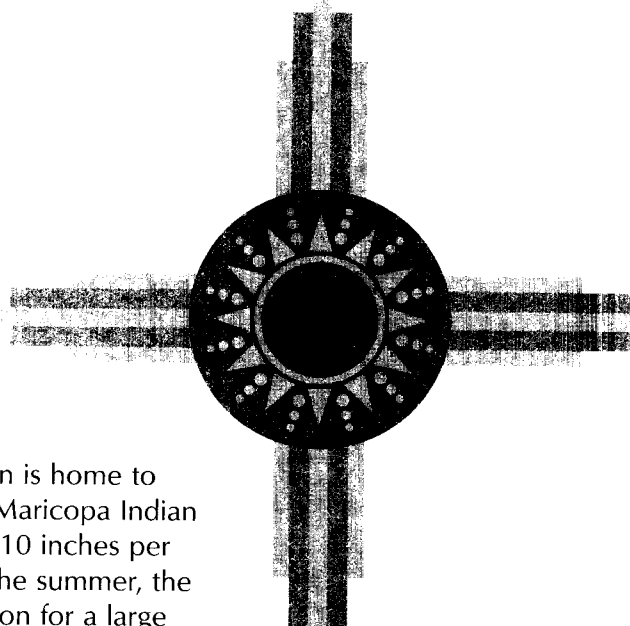
composting process—to community members at Earth Day fairs and other events. The children package the castings in take-out containers affixed with labels that explain how to use the compost. They assume ownership of the program and gain experience running a "business" while educating the community about the benefits of composting.

Mr. Reinbold and Ms. Manthe credit vermicomposting with reducing waste management costs, increasing childrens' self-esteem, and encouraging interaction between the generations. With such an impressive track record, worms could become permanent fixtures in classrooms across the country.

Salt River Landfill's Green Waste Composting Beats the Heat

Don't think you can compost in arid climates? Think again. The Salt River Pima-Maricopa Indian Community composts nearly 3,000 tons of yard trimmings and commercial landscaping waste each month!

Located just east of Phoenix, Arizona, the Salt River Reservation is home to approximately 6,000 enrolled members of the Salt River Pima-Maricopa Indian Community. With an average annual precipitation of less than 10 inches per year and an average high temperature of above 100°F during the summer, the Salt River Reservation might seem to be a less than ideal location for a large scale composting operation. Yet despite the hot, dry Arizona climate, the Salt River Landfill still manages to produce a high-quality product that makes its way onto the shelves of local nurseries, hardware stores, and home improvement centers.



The Salt River Pima-Maricopa Indian Community's green waste composting program is located at its permitted Subtitle D landfill. Owned and operated by the community, the Salt River Landfill is run as an autonomous enterprise. The community built the landfill for two purposes—to manage the reservation's municipal solid waste and to generate revenue. In fact, the majority of the waste received at the landfill comes from neighboring Mesa, Gilbert, and Scottsdale. As part of its contract with these communities, the landfill also accepts green waste, which consists of yard trimmings and landscaping wastes (e.g., grass clippings, tree trimmings, shrub trimmings) from both residences and commercial businesses, including landscaping companies.

The Salt River Landfill operators began the green waste program in 1996 in an effort to reduce the volume of materials landfilled. As green waste takes up a significant amount of landfill air space, separating and

managing it separately extends the operational life of the landfill by several years. Both the community and landfill operators felt that composting the green waste made sense economically, operationally, and environmentally. "It was just the right thing to do," explained Frank Velazquez, assistant general manager of the landfill.

Initially, a front-end loader broke apart incoming loads of green waste which were then hand-sorted by a four-man crew to remove contaminants. The sorted green waste was then ground in a tub grinder and placed in open-air piles to compost. Landfill staff monitored the temperature of the piles using hand probes and turned them regularly with the landfill's front-end loader to ensure proper aeration. The finished product was then shipped to a local mulch manufacturer that mixed in amendments, and bagged and sold the final product.

Not completely satisfied with the quality of its finished products, the

landfill operators decided to switch from using simple piles to composting in windrows. While this decision resulted in a more uniform final product, it also required additional equipment and increased operational costs.

Challenges: Climate and Contamination

As might be expected, the greatest challenge facing Salt River Pima-Maricopa Indian Community's green waste program was the area's climate. The hot, arid climate quickly dries the chipped material, short-circuiting the composting process and making compost piles and windrows a potential fire hazard. To address both these issues, the landfill staff installed a fire hydrant system at the dedicated 5-acre composting area. The hydrant system allows workers to spray the compost piles as needed to maintain the proper moisture levels to sustain the decomposition process. The system also doubles as a fire suppression system in case of a fire.

Another major problem was the contamination of incoming green waste with inappropriate materials such as painted or chemically treated wood. "If the community is not making a whole-hearted effort, one single bag of nongreen material can ruin entire batches of product," laments Mr. Velazquez. "Even nontoxic contaminants, such as plastics, glass, and other trash, can degrade the quality of the compost, creating an unaesthetic, even dangerous, final product."

To minimize contamination, the program managers work with the communities of Mesa, Gilbert, and Scottsdale to educate their residents about the types of waste acceptable for composting. Mr. Velazquez noted, "Mesa has an excellent program; it purchased special 90-gallon containers for its residents specifically for green waste. That has helped cut down on some of the contamination."

Changing Hands

After six years of successful composting, the landfill managers assessed the entire landfill and composting operation and decided that they were diverting a disproportionate amount of time and resources to the green waste program. At the same time, the green waste program was reducing the volume of waste disposed in the landfill and generating an environmentally beneficial

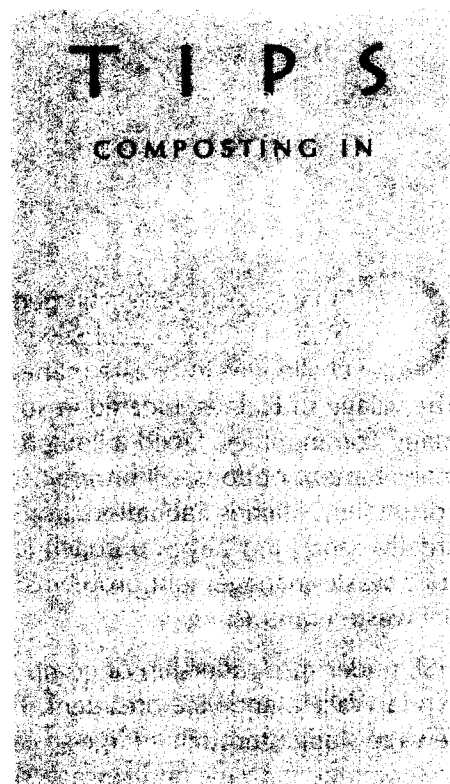
and useful product. Not wanting to end the program the landfill managers and tribe concluded that it made more sense economically and operationally to let the experts handle the composting operation.

To this end, the community hired a recycling company from Houston, Texas, to assume control and daily operation of the green waste program. "They are a very professional group," said Mr. Velazquez. "They brought in their own equipment and personnel and completely took over operation of the green waste composting program. They streamlined operations and now produce a very high quality compost material."

Currently, the green waste program is a break-even endeavor. The minimal tipping fee for incoming green waste charged by the landfill offsets the expense of paying the contractors to run the green waste program. Though not generating revenue, the program's real value is in saving space at the landfill—which translates into longer landfill life and continued revenue—and meeting the community's goal of trying to recycle as much as possible.

Composting in the Midwest

"It seems that everyone in the Midwest and East have great green waste programs, and that mulch and compost are used heavily in these areas," observes Mr. Velazquez. "In comparison, mulch and compost are not used as much in the West." He attributes this to the arid climate, the relatively few number of trees, and the abundance of rock and gravel in the area, which makes rock mulch the



more common choice for landscaping. Although using compost as a ground cover has not caught yet in the region, Mr. Velazquez, his subcontractor, and a few others in the field have high hopes for the increased use of this product in the West in the near future. They believe that as the cost of landfill space continues to increase, separating and composting, mulching, or grinding organic materials will become more common. "My overall message is that there is hope," opines Mr. Velazquez.

For other tribes considering green waste composting programs in any region—arid, humid, or even arctic—Mr. Velazquez offers this advice, "Educate yourself. Learn and understand the decomposition process by taking courses, such as SWANA's composting course; reading composting periodicals; and consulting with experts, especially local professionals with experience composting plants common to your region under local climatic conditions."



It's a good idea to have a person stand next to the compost pile for scale.

Climate, geography, and geology often combine to create seemingly insurmountable challenges for waste management in Alaska. The village of Haines, located in southeast Alaska, like many communities, faced a limited number of waste management options—all prohibitively expensive. Fortunately, Haines Sanitation, Inc. (HSI) devised a creative and innovative approach to solve the village's solid waste management problems: in-vessel municipal waste composting.

HSI, under the leadership of company president, Lynda Walker, and vice president, Tom Hall, is composting the village of Haines' municipal solid waste and sewage sludge through a large-scale, aerated in-vessel operation. This municipal waste composting treats unseparated garbage and sewage sludge from the village's wastewater treatment plant to create an inert material suitable for use as landfill cover.



Ms. Walker and Mr. Hall strongly believe in this process and hope to work with other villages in the near future to develop a customized system to meet their needs. "Spreading mixed compost or using it as a cover material for an existing open dump is a much better option than throwing untreated garbage and honey bucket waste on the tundra or into surface water. The health and environmental benefits will justify the costs to the villages." Ed Emswiler from Alaska Department of Environmental Conservation (ADEC) agrees, "It is a much better option than open dumping and much of the burning currently taking place in Alaska. HSI has demonstrated the technology works—now we just need to get out there and test it."

HSI turned to municipal waste composting as an affordable method for

managing the village's waste after exploring several other options. HSI's first option was to bring its

rejected as being too expensive. HSI then tried shipping waste to Seattle for disposal. After paying more than \$200,000 in one year and charging community members more than \$40 per month for a one can per week garbage pickup, this was also abandoned as too costly.

It was at this point that HSI decided to pursue composting. Over the next two years, HSI spent approximately \$500,000 designing, purchasing components, building, and perfecting its municipal waste composting system. The entire system, with the exception of the computer monitoring and control system, was built using off-the-shelf components and electronics. A significant portion of this sum was spent perfecting designs and addressing engineering and operational problems as the system was built. With this experience, Mr. Hall believes he could now

landfill into full compliance with the Subtitle D landfill requirements. This approach was immediately



HSI's composting process reduces the volume of waste and produces a usable product.

reduce the cost of developing a new system for a village to between \$300,000 and \$350,000, including all freight costs.

While this price is still high, HSI believes the potential improvements to village health and the environment justify the expense. Mr. Hall also points out that the process could potentially use fish waste or honey bucket waste (i.e., raw sewage) in addition to, or in place of, biosolids. "We just need to try it and work out the engineering," explains Mr. Hall.

Cost Savings and Other Benefits

While cost savings is the major motivator in HSI's composting, volume reduction, waste stabilization, and the generation of a usable product are other major benefits of municipal solid waste and sewage sludge composting. By reducing the volume of the 1,100 tons of waste it treats each year by about one-third, HSI's process will nearly double the life of the current Class III landfill (permitted for inert wastes only), according to Mr. Hall.

The composting process also effectively neutralizes organic materials in waste and sludge that attract birds, rats, foxes, dogs, bears, insects,

and other disease vectors. The process destroys organic compounds that can leach from untreated waste and contaminate drinking water supplies or valuable fishing waters. "Our compost will not leach or attract ani-

mals. We have not had any problems with bears, and the ravens are really not happy with us," reports Mr. Hall. The decomposition process also decontaminates sewage sludge, making it safe for disposal—an important health consideration for many Alaskan villages.

HSI's finished compost also can be used as landfill cover material. Adequate volumes of suitable cover material are extremely hard to find and expensive to procure in many parts of Alaska, particularly in remote tundra settings. HSI believes that the large amounts of decontaminated, inert compost that its process generates presents a low-risk alternative to expensive imported cover materials. At this time, HSI is

awaiting ADEC approval to use the final compost as cover material at its Class III landfill. Mr. Hall is confident they will receive approval. "It makes an excellent cover material as it compacts well and can support plant growth," he explains.

HSI's mixed waste composting combines most of the municipal solid waste generated by the Haines community and sewage sludge from the community's wastewater treatment plant. Some materials such as construction and demolition (C&D) debris and other large items are separated and taken directly to the landfill. The materials collected through the community voluntary recycling program are, likewise, managed separately and not composted.

The first step in the process is shredding the garbage and mixing it with the biosolids from the wastewater treatment plant. The shredding and mixing takes place in a mixing trommel, a 12-foot diameter by 30-foot long, knife-lined rotating drum. After spending two hours in the mixing trommel, the waste/sludge mixture is ready to be placed in the digester.

Using the proper carbon-to-nitrogen ratio (i.e., waste to biosolids) is

EPA 503 REQUIREMENTS

The Subpart D (pathogen and vector attraction reduction) requirements of 40 CFR Part 503 regulations were developed for the land application or disposal of biosolids (sewage sludge). For biosolids to be applied to lawns and gardens as a soil amendment, they must meet the Class A Pathogen and Vector Attraction Reduction Guidelines. These guidelines require that temperatures be sustained during the biosolid composting process at 55° Celsius (131° Fahrenheit) or greater for at least three days if in-vessel or static aerated piles are used, or 55° Celsius or greater for at least 14 days if aerated windrows are used. There are no federal composting requirements, but many composters use the 503 regulations as guidelines for their composting operations.

To keep temperatures within the digester from getting too high

Due to its unsegregated nature, the compost contains small shards of glass, plastic, metal, and other items that can pose a safety hazard. Occasionally, needles end up in the compost when community members throw them in the trash instead of taking them to the community health facility for proper disposal. Because the compost frequently contains these dangerous items, HSI workers wear protective safety gear (e.g., gloves, boots, and aprons) when handling it.

RESOURCES



PUBLICATIONS

Appelhof, Mary. *Worms Eat My Garbage: How to Setup and Maintain a Vermicomposting System.*

Kalamazoo, Michigan: Flower Press, 1982. <www.wormwoman.com>

U.S. EPA. *Biosolids Technology Fact Sheet: In-Vessel Composting of Biosolids* (EPA832-F-00-061)

<www.epa.gov/owm/mtb/invessel.pdf>

U.S. EPA. *Biosolids Technology Fact Sheet: Use of Composting for Biosolids Management* (EPA832-F-02-024)

<www.epa.gov/owm/mtb/combioman.pdf>

U.S. EPA. *Composting Yard Trimmings and Municipal Solid Waste* (EPA530-R-94-003)

<www.epa.gov/epaoswer/non-hw/compost/cytmsw.pdf>

U.S. EPA. *Fact Sheet: Cover up with Compost* (EPA530-F-02-002)

<www.epa.gov/epaoswer/non-hw/muncpl/ghg/f02022.pdf>

U.S. EPA. *GreenScapes Brochure* (for large land-use applications) (EPA530-K-03-003) <www.epa.gov/epaoswer/non-hw/green/pubs/brochure.pdf>

U.S. EPA. *GreenScaping Your Lawn and Garden* (brochure for homeowners) (EPA530-K-03-002)

<www.epa.gov/epaoswer/non-hw/green/pubs/home-gs.pdf>

U.S. EPA. *Waste Prevention, Recycling, and Composting Options: Lessons from 30 Communities*

(EPA530-C-01-002) <www.epa.gov/epaoswer/osw/cdoswpub.htm>

WEB SITES

Better Composting School, sponsored by the University of Maryland/Maryland Cooperative Extension <www.agnr.umd.edu/users/Bioreng/recyclegreen.htm>

Cooperative State Research, Education, and Extension Service (CSREES), U.S. Department of Agriculture. <www.csrees.usda.gov/Extension/index.html>

Cornell University/Cornell Waste Management Institute Composting Web site <cwmi.css.cornell.edu/Composting.html>

greenroofs.com

<www.greenroofs.com>

Green Roofs for Healthy Cities

<www.greenroofs.org>

Green Roof Plants

<www.greenroofplants.com>

U.S. Composting Council

<www.compostingcouncil.org/index.cfm>

U.S. EPA Composting Web site

<www.epa.gov/compost>

U.S. EPA GreenScapes Web site

<www.epa.gov/greenscapes>

U.S. EPA Jobs Through Recycling: Organics Web page

<www.epa.gov/epaoswer/non-hw/recycle/jtr/comm/organics.htm>

U.S. EPA Waste Management in Indian Country

<www.epa.gov/tribalmsw>

Solid Waste Alaskan Network (S.W.A.N.)—Composting

<www.ccthita-swan.org/Tutorials/composting_final.cfm#9>

Solid Waste Association of North America composting certification.

<www.swana.org>

Washington Organic Recycling Council (WORC) composting training

<www.compostwashington.org>

FUNDING

U.S. Department of Agriculture Value-Added Producer Grants

<www.rurdev.usda.gov/rbs/coops/vadg.htm>

Bureau of Indian Affairs Environmental Management Program grants—contact your BIA regional environmental scientist

Denali Commission Solid Waste Program <www.denali.gov/Program_Documents.cfm?Section=Solid%20Waste>

RELATED RESOURCES

Annual Native American Permaculture Design Course Permaculture—permanent (Agri) culture—is the harmonious integration of landscape and people, providing food, energy, shelter, and other needs in a sustainable way for all species. It is a holistic approach based on traditional practices. For more information contact:

Traditional Native American Farmers Association
Phone: (505) 983-2172
or (505) 412-0336
E-mail: tnafanm@yahoo.com
or teszu@aol.com

The National Gardening Association, a nonprofit organization established to help gardeners, has a series of articles on the many uses of native plants.

Native Plants as Food
<www.nationalgardening.com/special/tmi/article3.asp>

Native Plants as Medicine
<www.nationalgardening.com/special/tmi/article4.asp>

Native Plants for Fiber, Dyes, and Other Uses
<www.nationalgardening.com/special/tmi/article5.asp>

PERIODICALS

BioCycle Journal of Composting & Recycling. JG Press Inc.
<www.jgpress.com/biocycle.htm>

Composting News. <www.recycle.cc>

Worm Digest. <www.wormdigest.org>

CONTACTS



The Tribal Waste Journal would like to thank everyone who shared their stories and experiences for this issue. Interviewee contact information is provided below for those who are interested in learning more about specific tribes' programs.

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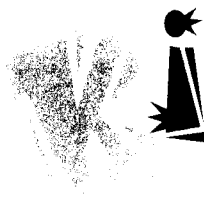
Salt River Pima Maricopa Indian Community in Arizona

Scottsdale, Arizona

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480 941-3427, ext. 20
fvelazquez@srlandfill.com

Alaska Department of Environmental Conservation

Ed Emswiler
907 465-5353
Ed_Emswiler@dec.state.ak.us



Want a way to deliver your waste management or environmental message 12 months of the year? Create a calendar and fill it with recycling, composting, and other waste reduction tips. Consider sponsoring a poster or photography contest for students as artwork for the calendar to get kids excited and involved. The Red Lake Band of Chippewa Indians held a poster contest for middle school students. More than 40 students submitted posters with a pollution prevention and protecting the environment theme. Red Lake Department of Natural Resources staff selected the 12 winning posters for use in the calendar and distrib-

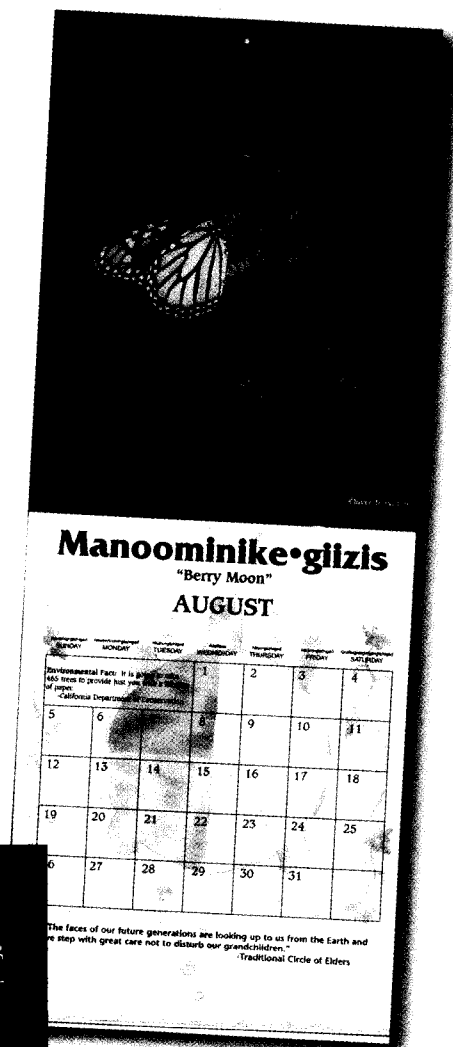
uted more than 500 calendars to tribal members.

The White Earth Band of Chippewa Biology Department also produced a calendar to increase environmental awareness within the community. The calendar featured photographs of scenic areas on the reservation, such as a local landing at sunset and native wildlife, and contained environmental quotations in Ojibwa from famous chiefs. The tribe packed the back page of the calendar with information on its solid waste ordinance and ways for members to report illegal dumping incidents.

COMPOST CROPS

After your kids have put in all the hard work and effort composting yard trimmings or food scraps in their backyard and vermicomposting bins, here is a great exercise to demonstrate the usefulness of compost. Using two similar garden plots—one with a bucket of compost mixed into the soil and one without—kids can compare compost's influence on the plants' rate of growth. Over a 4 or 5 week period of watering, weeding, and measuring the plant growth for each of the plots, kids can compare the size and appearance of the plants in both plots. They can also dig up one plant from each plot and compare the root structures of both plants, and dig around in the soil and examine and compare differences between the soil texture, moisture content, and presence of worms or other insects. When the vegetables are ripe, harvest and have a feast!

For additional information about this activity, visit <http://www.epa.gov/epaoswer/osw/kids/quest.pdf#37crops.pdf>, or order a free copy of *The Quest for Less: Activities and Resources for Teaching K-6* (EPA 530-R-00-008) from EPA's National Service Center for Environmental Publications (NSCEP) at 1-800-490-9198.



FirstGov For Kids <www.kids.gov> is the U.S. government interagency Kids' Portal developed and maintained by the Federal Citizen Information Center. It provides links, grouped by subject, to federal kids' sites along with some of the best kids' sites from other organizations. Included are links to numerous composting, vermicomposting, and recycling sites.

healthfinder®, <www.healthfinder.gov> developed by the U.S. Department of Health and Human Services, is an excellent resource for finding government and nonprofit health and human services information on the Internet. Among the links to more than 1,500 health-related organizations' Web sites, are links to numerous environmental health sites, including several composting and recycling sites.

EPA's Planet Protectors Club for Kids
<www.epa.gov/epaoswer/osw/kids/index.htm>

Kids Recycle! Composting
<www.kidsrecycle.org/composting.php>

Recycling: Make a Compost Heap for Your Garden (World Wildlife Fund)
<www.panda.org/news_facts/education/middle_school/homework_help/projectidea.cfm?piid=1>

Reduce Waste—If Not you, Who?
(Minnesota Office of Environmental Assistance) <www.reduce.org>

U.S. National Resource

Ask the Answer Worm!
<www.nrcs.usda.gov/feature/education/squim/skworm.html>

As the Worm Turns: Worm Composting at Portland Public Schools
<www.pps.k12.or.us/district/depts/fam/enviro/wormturns.shtml>

Kids Recycle! Vermi-composting
<www.kidsrecycle.org/worms.php>

National Institute of Environmental Health Sciences (NIEHS) Kids' Pages: Vermicomposting (Making Good Use of Garbage!)
<www.niehs.nih.gov/kids/worms.htm>

The Adventures of Herman: The Autobiography of Squirmin' Herman the Worm <www.urbanext.uiuc.edu/worms/index.html>

Worm Away Your Cafeteria Food Scraps (North Carolina Cooperative Extension Service) <www.ba.ncsu.edu/people/faculty/sherman/worms.html>

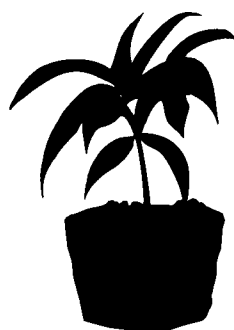
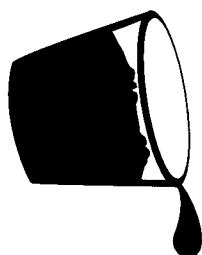
Junior Master Gardener
<www.k2demo.com/jmg/index.k2?did=2016§ionID=2016>

University of Illinois Extension: My First Garden: A Guide to the World of Clever and Fun Gardening
<www.urbanext.uiuc.edu/firstgarden/index.html>

Here is an activity that lets kids close the loop on used paper by creating recycled paper planters out of used newspaper. Begin by soaking small pieces of shredded newspaper and pulping the paper fibers with a hand egg beater until it looks like mush. Then mold the pulp to the inside of a plastic cup-shaped container or soda bottle with the top cut off, squeezing out as much water as possible. Let the pulp dry completely for the next three days. Carefully remove the handmade recycled paper planter from its mold, and it is ready for use! The planter can be transplanted in the ground where it will decompose

and provide nutrients to the plant as it takes root and grows. You can further close the loop by using compost from classroom vermicomposting or backyard bins and planting the seedlings in school or home gardens.

For additional information about this activity, visit <<http://www.epa.gov/epaoswer/osw/kids/quest/pdf/29plant.pdf>>, or order a free copy of The Quest for Less: Activities and Resources for Teaching K-6 (EPA530-R-00-008) from EPA's National Service Center for Environmental Publications (NSCEP) at 1-800-490-9198.



COMPOSE YOUR OWN COMPOSTING SONG

THE COMPOST SONG: "TAKE ME OUT TO THE COMPOST"
(Sung to the tune of "Take Me Out to the Ball Game")

Take me out to the compost,
Where the worms do their work,
For they don't live it's a shame,
For in two, four, six weeks, I'll be
In the old garden.

—Pam Ahearn, Waits River School,
East Corinth, Vermont